REMARKS

By the present Amendment, claims 1, 19, 21, and 23 have been amended. No claims have been added or cancelled. Accordingly, claims 1, 2, 6, 8, 12, and 16-24 remain pending in the application. Claims 1, 19, 21, and 23 are independent.

In the Office Action of March 30, 2010, claims 1, 2, 6, 8, 9, 12, and 16-24 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 5,517,994 issued to Burke et al. ("Burke"), in view of Japanese Patent No. JP 5000138 to Yoichi, and further in view of U.S. Patent No. 6,602,196 issued to Suzuki et al. ("Suzuki"). This rejection is respectfully traversed.

Applicants would like to thank Examiners Gupta and Le for the allocating time to conduct the interview of September 15, 2010. During the interview, Applicants discussed proposed claim amendments intended to clarify the features of the invention as set forth in the independent claims. Applicants explained that the cited references did not appear to disclose or suggest detecting when the probe is left in the air based on reconstructed diagnostic image information. Applicants also indicated that the references did not reduce the frame rate to a lower value that is also sufficient for moving image reproduction of the diagnostic image. It was agreed that these featured did not appear to be suggested or taught by the prior art. It was also agreed to further amend the claim language to recite "a judging section configured to judge".

In rejecting the claims, the Office Action alleges that Burke discloses an ultrasonic diagnostic system capable of performing self diagnostic tests on the system processing and control channels coupled to the transducer elements of an ultrasonic probe as well as the ultrasonic probe itself. The Office Action asserts that the probe transmits and receives ultrasonic waves to and from a test subject, and

that the system includes a diagnostic processor which is coupled to a number of sub-systems, a beamformer, and an image-and-Doppler processor which processes digital echo signals to form an image or to make a diagnostic measurement such as the velocity of blood flow in the subject's body. The resultant image or measurement is then displayed on a display. The Office Action further asserts that Burke teaches a judging section that allows the diagnostic processor to monitor the probe-air interface by performing "self diagnostic tests" and adjusts operating characteristics of the system electronics accordingly.

Yoichi is relied upon for teaching that the ultrasound system can adjust operating characteristics by interrupting drive signals of the probe based on judgment of whether the probe has been left in the air. Yoichi (and Burke) are both indicated as adjusting or controlling the imaging device specifications or parameters such as wave transmission based on whether the judging unit determines the probe has been left in the air so that the control section reduces the frame rate to be sufficient for moving image reproduction of the diagnostic image. Suzuki is relied upon for describing a relationship among "sound-ray density", scan range, and frame rate. Additionally, the Office Action asserts that Suzuki explains that frame rate is inversely related to sound-ray density, and that if sound-ray density is kept constant, then the frame rate remains constant as well. The Office Action concludes that it would have been obvious to combine the teachings of Burke with those of Yoichi and Suzuki in order to arrive at the claimed invention. Applicants respectfully disagree.

As amended, independent claim 1 defines an ultrasonic diagnostic apparatus that comprises:

> a probe that transmits/receives ultrasonic waves to/from a test subject;

a transmitting section that supplies a drive signal to the probe;

a receiving section that receives a reflection echo signal outputted from the probe;

an image constructing section that reconstructs a diagnostic image on the basis of the received reflection echo signal;

a display section that displays the diagnostic image constructed by the image constructing section; and

a control section that controls these sections,

wherein the ultrasonic diagnostic apparatus includes a judging section configured to judge, on the basis of the diagnostic image information which is reconstructed from the image constructing section when the probe transmits/receives ultrasonic waves, that the probe is left in the air, and when the judging unit judges that the probe is left in the air, the control section controls the drive signals supplied to the probe from the transmitting section so as to reduce the frame rate to a value that is lower than the present frame rate but in a range sufficient for moving image reproduction of the diagnostic image.

The ultrasonic diagnostic apparatus of independent claim 1 includes a probe which transmits/receives ultrasonic waves to/from a test subject, a transmitting section that supplies a drive signal to the probe, a receiving section that receives a reflection echo signal output from the probe, an image reconstruction section that reconstructs a diagnostic image based on the received echo signal, and a display section that displays the diagnostic image constructed by the image construction section. A control section is provided for controlling the probe, transmitting section, receiving section, image reconstructing section, and display section. A judging section is further provided to determine whether the probe has been left in the air based on the diagnostic image information. The judging section is configured to make this determination using diagnostic image information that is reconstructed from the image constructing section when the probe transmits/receives ultrasonic waves. If the judging section determines that the probe has been left in the air, then

the control section controls the drive signals supplied to the probe from the transmitting section to reduce the frame rate to a value that is lower than the present frame rate but in a range that is sufficient for moving image reproduction of the diagnostic image.

In response to Applicants' previously submitted arguments, the Office Action alleges that Burke determines whether the probe has been left in the air based on the diagnostic image information. The Office Action further indicates that an idle probe is a form of diagnostic image information because it is an indication that image formation has ceased. Applicants respectfully disagree.

Burke does not make this determination based on diagnostic image information that is reconstructed from the image construction section, as set forth in independent claim 1. Rather, Burke performs self diagnostic tests that activate the transducer elements of the idle probe, and a surface reflection signals returned from the probe-air interface are received and processed on a channel by channel basis. Analysis of these signals reveals various characteristics of the conditions of the probe, and allows them to be reported to the user or a service personnel. See column 1, lines 48-63. Burke also indicates that the system controller can detect when the system is sitting idle and not being used to diagnose patients by monitoring when an extended period of time has passed without receipt of echo information. Accordingly, it is clear that Burke makes any determinations regarding the status of the probe based on the receipt of echo signals and not based on diagnostic information from the reconstructed image itself. Furthermore, Burke requires passage of an extended time period prior to even making a determination that the probe is not in use. See column 7, lines 47-52. In contrast, the present invention determines when the probe is idle based on the reconstructed diagnostic image

information and reduces the frame rate for moving image reproduction. This allows, for example, the output signals from the probe to be reduced while the probe is moved away from the patient but still being used.

Next, the Office Action alleges that Yoichi also discloses the control section reducing the frame rate to be sufficient for moving image reproduction of the diagnostic image based on whether the probe is determined to have been left in the air. Applicants again disagree. Yoichi suffers from the same deficiency as Burke with respect to the manner in which it is determined whether the probe has been left in the air. According to Yoichi, the judging section determines whether or not the probe is neglected in the air by detecting multiple echoes of the ultrasonic wave that are produced in an acoustic lens. More particularly, the reflective detection means detects reflection of the ultrasonic wave by an acoustic lens and makes the determination as to whether or not the probe is left in the air. If it is determined that the probe has been left in the air, then wave transmission is interrupted. Yoichi never examines the diagnostic image information that is reconstructed from the image constructing section. See paragraph [0007].

Additionally, while Yoichi discusses controlling wave transmission of the ultrasonic probe as an alternative to interruption thereof, there is no disclosure or suggestion for controlling the drive signals provided to the probe from the transmitting section so that the frame rate is reduced to a value that is lower than the present frame rate, but within a range that is sufficient for moving image of the diagnostic image. In fact, Yoichi expressly indicates that when the probe is determined to have been left in the air, the control means for transmitting transmit a single time out of 100 times. Consequently, the remaining 99 times are omitted. See paragraph [0013]. Based on Yoichi's express disclosure, it is inconceivable that

one would conclude that a single transmission out of 100 would be sufficient to reproduce the moving image. The cited references simply fail to provide any disclosure or suggestion for features recited in independent claim 1, such as:

> wherein the ultrasonic diagnostic apparatus includes a judging section configured to judge, on the basis of the diagnostic image information which is reconstructed from the image constructing section when the probe transmits/receives ultrasonic waves, that the probe is left in the air, and when the judging unit judges that the probe is left in the air, the control section controls the drive signals supplied to the probe from the transmitting section so as to reduce the frame rate to a value that is lower than the present frame rate but in a range sufficient for moving image reproduction of the diagnostic image.

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

Claims 2, 6, 8, 9, 12, and 16-18 depend from independent claim 1, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

By the present Amendment, Applicants have amended independent claims 19, 21, and 23 to incorporate features similar to those that have been incorporated in independent claim 1. Specifically, these claims have been amended to indicate that the judging section determines whether or not the probe has been left in the air based on various information that is reconstructed from the image constructing section when the probe transmits/receives ultrasonic waves. Additionally, upon determining that the probe has been left in the air, the control section reduces the frame rate to a value that is lower than the present frame rate, but in a range that is

sufficient for moving image reproduction of the diagnostic image. As previously discussed, such features are not shown or suggested by the art of record.

It is therefore respectfully submitted that independent claims 19, 21, and 23 are allowable over the art of record.

Claims 20, 22, and 24 depend from claims 19, 21, and 23, respectively, and are therefore believed allowable for at least the reasons set forth above with respect to these claims.

For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 520.45475X00).

Respectfully submitted,
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Dated: September 30, 2010